REMARKS/ARGUMENTS

The present amendment is in response to the Office Action mailed July 16, 2003, in which Claims 1 through 17 and 20 through 32 were rejected. Applicants have thoroughly reviewed the outstanding Office Action including the Examiner's remarks and the reference cited therein. The following remarks are believed to be fully responsive to the Office Action and, when coupled with the amendments made herein, are believed to render all claims at issue patentably distinguishable over the cited references.

Claims 3 and 8 are amended herein. No claims are cancelled. No claims are added. Accordingly, Claims 1 through 17 and 20 through 32 remain pending.

All the changes are made for clarification and are based on the application and drawings as originally filed. It is respectfully submitted that no new matter is added.

Applicants respectfully request reconsideration in light of the above amendments and the following remarks.

CLAIM REJECTIONS - 35 U.S.C. SECTION 112

With respect to Paragraphs 3 and 4 of the Office Action, the Examiner rejected Claims 3 and 8 under 35 U.S.C. Section 112, first paragraph, as failing to comply with the enablement requirement. Particularly, the Examiner is of the opinion that Claims 3 and 8 recite the limitation "Mw/Mn from 1" and that neither the state of the art nor the disclosure provides a method by which one skilled in the art would enable the production of a propylene polymer or polyethylene wax wherein Mw/Mn is 1 or close to 1.

Applicants respectfully traverse these rejections.

Applicants have amended Claim 3 for clarification herein by changing "of from 1 to 10" to ûselected from the group consisting of 10 and less than 10--. Applicants have amended Claim 8 for clarification herein by changing "from 1 to 2" to --selected from the group consisting of 2 and less than 2--.

Applicants respectfully request that the rejections under 35 U.S.C. Section 112 be reconsidered and withdrawn.

CLAIM REJECTIONS - 35 U.S.C. SECTION 103(a)

With respect to Paragraph 5 of the Office Action, the Examiner rejected Claims 1, 2, 5 through 10, 14, 15, 17, 20, 21, 24, 25 and 27 through 32 under 35 U.S.C. Section 103(a) as being unpatentable over U.S. Patent No. 5,667,902 to Brew *et al.* (hereinafter referred to as "Brew *et al.*") in view of U.S. Patent No. 6,312,825 to Su *et al.* (hereinafter referred to as "Su *et al.*") or U.S. Patent No. 5,155,160 to Yeh *et al.* (hereinafter referred to as "Yeh *et al.*")

With respect to Paragraph 7 of the Office Action, the Examiner rejected Claims 12, 13, 16, 22 and 23 under 35 U.S.C. Section 103(a) as being unpatentable over Brew *et al.* in view of Su *et al.* or Yea *et al.*

With respect to Paragraph 8 of the Office Action, the Examiner rejected Claims 4, 11 and 26 under 35 U.S.C. Section 103(a) as being unpatentable over Brew *et al.* in view of Su *et al.* and further in view of U.S. Patent No. 5,246,769 to Murschall *et al.* (hereinafter referred to as "Murschall *et al.*").

With respect to Paragraph 9 of the Office Action, the Examiner rejected Claims 4, 11 and 26 under 35 U.S.C. Section 103(a) as being unpatentable over Brew *et al.* in view of Yeh *et al.* and further in view of Murschall *et al.*

Applicants respectfully traverse these rejections.

A. Su *et al.*

Initially, Applicants observe that with respect to the reference to Su *et al.*, this patent was filed on September 21, 1998, and was issued on November 6, 2001. There is no earlier priority

date. Applicants observe that the instant application is a Section 371 filing of PCT/EP99/00847 having a date of February 10, 1999, based on Germany document 198 05 640.0 having a date of February 12, 1998, and Germany document 198 35 953.5 having a date of August 8, 1998. Thus the earliest critical date of the instant application predates the earliest critical date of the patent to Su *et al.*

Accordingly, Applicants respectfully request that the patent to Su *et al.* be removed as a reference.

B. Brew *et al.*

Brew *et al.* relates to a hard resin modified film. While Brew *et al.* mentions in a very general manner the use of wax as a slip agent, there is no relation between wax and a barrier which can be derived from this reference. In relation to waxes, Brew *et al.* disclose nothing but general common knowledge that some waxes are known to provide slip and that accordingly such waxes are used to improve the coefficient of friction of films.

C. Yet *et al.*

Regarding Yeh *et al.* (and Su *et al.*), disclosure is made of special waxes have barrier-improving effects on films. However, Yet *et al.* (and Su *et al.*) fail to disclose anything - either directly or indirectly - in relation to combinations of waxes with other additives.

Applicants believe that a further explanation of the general concepts underlying the present invention is appropriate at this point in the analysis. In general, the present invention is characterized by a *combination of wax and hard resin in one layer in order to improve the*

barrier properties of the film disclosed in the application. Applicants respectfully submit that such a combination has not been disclosed previously.

Yeh *et al.* (or Su *et al.*) disclose the addition of a wax to polypropylene films in order to improve the barrier. But there is no teaching or suggestion in the cited art to combine the wax with any additional hard resin. Su *et al.* teach how the wax and a specific polar surface layer interact (col 4, lines 17 - 60). However, no skilled artisan would be motivated to combine the wax with an additional component, since the artisan would not be sure how such additional component will affect the desired interaction and the migration of the wax. There is no suggestion at all in Su *et al.* as to how to further improve the barrier of a wax-containing film.

D. The State Of The Art At The Time Of The Invention

Applicants respectfully submit that an understanding of the state of the art of barrier films at the time the invention was made is an important element in the present differentiating analysis. Biaxially oriented polypropylene films are known for having amorphous and crystalline regions. The amorphous regions are believed to be the weak spots which impair the barrier, whereas the crystalline regions provide a very good barrier. The optimum circumstance would be to have a 100% crystalline polypropylene film to provide the best barrier which polypropylene can theoretically provide. The unfortunate reality is that such a polypropylene does not exist and, moreover, it could not be worked into a biaxially oriented film, since with growing crystallinity the stretchability of the polypropylene actually decreases. This situation is confirmed by the teaching of Brew *et al.* (col. 1, lines 62 - 66).

Because of the amorphous regions inherently present in a biaxially oriented polypropylene film, the skilled artisan would search for the right material to fill these amorphous regions in an effort to improve the barrier. Hard resin are known (and have been known) to serve this purpose in a very effective way. Also barrier waxes were used to fill amorphous regions. This is set forth in Yet *et al.*:

> "Even the most crystalline polyolefins have some amorphous regions. It is further believed that the wax crystallises in the amorphous regions of the polyolefin and that this phenomena explains the significant improvement in barrier properties." (Yeh *et al.*, col. 1, lines 59-62)

The understanding was that the barrier is improved by a wax **OR** a hard resin through migration into the amorphous regions of the polypropylene film. Accordingly, the prior art teaches the improvement of the barrier of biaxially oriented polypropylene films by the addition of either a wax **OR** a hard resins. At the time the invention was made the theory about barrier, waxes and hard resins dictated that the respective additives migrate into the amorphous regions of a polyolefin where they crystallize and thereby reduce the barrier of the film. By these modifications of plain oriented polypropylene film the barrier could be improved to the same degree by either wax or hard resin. The fact that wax or hard resin taken alone provides a similar barrier to a polyolefin film confirmed the understanding that the mode of action of hard resin or wax is similar. Accordingly, the only conclusion that could be reached by the skilled artisan was that once the amorphous regions were filled with either the wax **or** the hard resin the best possible or maximum barrier improvement has been achieved. The addition of more material would not lower the transmission rate. This means simply that up to a the presence of a certain amount of hard resin or wax the respective ingredient does have an improving effect on the

barrier, but once this concentration is exceeded any additional amount does not contribute to further improvement, because the amorphous regions are filled up to a maximum level.

That this is so is confirmed by Figure 1 of Yeh *et al.* in relation to wax. Yeh *et al.* demonstrate that after exceeding a maximum amount of wax the barrier is even impaired. On the other hand the concept is confirmed in relation to hard resin as disclosed by Brew *et al.* which clearly explain that loading levels of hard resin beyond 90% of resin does not provide a further increase in the barrier (see col 3, lines 17 - 33). The investigations of the Applicants disclosed similar results. The examples and comparative example demonstrate that more than 5% wax *did not* lower the transmission values any further. Reference may be had to Applicants' comparative data for verification. Starting from plain biaxially oriented polypropylene the water vapor barrier according to the Applicants' measurements is 0.37 or 1.28 (please refer to comparative Example 8 which relate to restive values depending on the conditions). The transmission is lowered by wax to 0.3 at 3% wax (comparative Example 2) and to 0.24 at 5% wax (comparative Example 10). More than 5% wax did not lower the transmission value below about 0.24, and these results are in concert with the results identified in Yet *et al.*

Applicants have also found that, similar with hard resin, the transmission could be reduced to 0.27 at 8 % resin (comparative Example 1) and to 0.25 at 10% resin (comparative Example 7). Again, with the addition of more hard resin a minimum value is reached asymptotically of slightly below 0.25. This number could possibly be reduced to, at best, 0.22 with very high amounts of hard resin like 20%. Accordingly, Applicants have fully demonstrated that the transmission cannot be lowered to a point below about 0.24 with EITHER wax OR hard resin directly because the amorphous regions have been filled to a maximum

degree. This finding is also consistent with the teachings of both Brew *et al.* and Yeh *et al.* It is quite clear that from such teachings a skilled artisan would never have thought that there would be a synergistic effect when hard resin and wax were combined.

It is important to observe that the starting point of the present invention was the barrier that could be achieved with *either wax or hard resin.* The inventors had in mind the further reduction of the barrier properties of a film, which barrier is already very good. As a result of their studies, the inventors found two very *surprising* and *unpredictable* effects: If one were to take a film having, for example, 10 % resin, the barrier of this film could not be improved with the addition of more hard resin. However, such a barrier *could* be improved through the addition of a wax. On the other hand, if one were to take a film having 5% wax, the barrier of this film would *not* be improved by the addition of further amounts of wax. Yet the barrier qualities *could* be improved further through the addition of a hard resin. It was *surprising* and *unexpected* to the inventors to find that the transmission levels could be lowered *at all* to values below the minimum reached before, namely below the previously-identified minimum values of about 0.25/0.24. With the combined additives extremely low transmission rates of 0.19/0.17/0.12 (please see examples 3, 2 and 6) could be achieved, which have never been reached before.

As to the operations of the mechanism involved, these are not fully understood. It is not known, for example, whether or not the additional material fits into the amorphous voids or other "vacant" regions. It is also not known, by way of further example, whether the wax affects the crystallization of the hard resin in the amorphous regions or whether this mechanism is the other way around. However, even though the mechanism is not completely understood, the teaching which the inventors have found is very clear, which is that the effect of the combination of wax

and hard resin on the barrier of a oriented polypropylene film is different from that which would result form the use of the wax or the hard resin alone. The combination is superior to that previously known in that lower transmission rates are obtained than were achievable according to known methodologies. The combination is also superior in that these superior results can be achieved through the use of *less* additive to achieve the same barrier improvement. These results are clearly demonstrated by the examples and comparative examples. Reference is particularly made to 8% +3% makes 0.18 (Examples 3 or 9) whereas 10% makes 0.25 (Example 7, hard resin) or 0.24 (comparative Example 10, minimum with wax).

Applicants respectfully submit that such results can only support their argument that their invention is not obvious in view of any known art. Applicants further respectfully submit that it cannot be said that the mere mentioning of wax in such a general manner as in Brew *et al.* can be taken to render obvious the present invention as currently claimed, either when taken alone or in combination with the other cited art. This is even more the case given the specific waxes which had to be *carefully selected* for such a synergistic effect.

Applicants' data clearly show criticality of the distinguishing features. Applicants submit that the present invention is not obvious in view of the prior art for at least two reasons. First, there is one surprising effect with respect to the molecular weight in that only a selected molecular weight gives the desired effect. Secondly the combined additives interact differently on the barrier than do the single additives. None of this can be derived from the prior art.

E. **Supplemental Examples**

To further underscore the absence of obviousness of the present invention as claimed relative to the teachings of the cited art, Applicants prepared additional differentiating examples. These examples result in a film produced according to the comparative Example 7 set forth in the specification. For the sake of consistency, the following examples were prepared in the same manner as disclosed in comparative Example 7 with the only difference being that the hard resin content has been raised stepwise 12 % by weight; 14 % by weight and 15% by weight, according to comparative Examples 11, 12 and 14. In the same manner additional examples having 6 and 8 % by weight of wax were prepared and are presented below. The water vapor permeation at 38°C and 90% humidity was measured.

Example	**Barrier**	**Hard Resin Content**
Comp EX 1	0.27	8
Comp EX 7	0.25	10
Comp EX. 11	0.24	12
Comp EX 12	0.23	14
Comp EX 13	0.23	15

These results clearly demonstrate that no improvement was achieved by raising the hard resin content further in that the amorphous regions are filled by the hard resin. The same is true for wax modification:

Example	**Barrier**	**Wax Content**
Comp EX 9	0.3	3
Comp EX 10	0.24	5
Comp EX. 14	0.28	6
Comp EX 15	0.3	8

These findings are even more convincing if the data contained in the specification are viewed in a slightly different way as set forth hereafter.

Comparative Examples 1 (8% resin) and 7 (10% resin) demonstrate the reduction of the water vapor transmission from 0.27/0.95 with 8% of hard resin to 0.25/0.87 with 10% of hard resin. This means that the addition of a further 2 % of hard resin to comparative Example 1 reduces the transmission from 0.27 to 0.25 or 0.095 to 0.87 respectively, thus producing a difference of 0.02/0.07 units, less than 10% improvement.

When comparative Example 1 is modified by adding a similar amount of wax, the transmission goes down from 0.27/0.95 to 0.19/0.62 (see Example 3). So these results clearly demonstrate a synergistic effect of wax and hydrocarbon resin. The transmission is now reduced by 0.08/0.33 units which corresponds to an improvement of about 30 and 35% (the percentage being based on the higher value).

	Barrier with 8% resin	Barrier Improvement		Difference in units	Improvement in %
At 38 °C/90% humidity	0.27	0.25	2% more resin	0.02	7
	0.27	0.19	3% wax	0.08	30
At 23 °C/80% humidity	0.95	0.87	2% more resin	0.08	8
	0.95	0.62	3% wax	0.33	35

It seems quite clear that the skilled artisan could not have derived from the prior art that adding a low molecular weight resin to a high barrier film (having already a good barrier due to the incorporated wax) would further reduce the water vapor permeability. As a corollary, it is also quite clear that the skilled artisan could not have derived from the prior art that adding a wax

to a high barrier film (having already a good barrier due to the incorporated low molecular weight resin) would further reduce the water vapor permeability. It is a synergistic effect of both components which can by no means be derived from the prior art. Applicants respectfully submit that there is absolutely no motivation to combine resin and wax.

Reconsideration and withdrawal of the rejections under 35 U.S.C. Section 103(a) are respectfully requested.

CONCLUSION

In light of the above amendments and remarks, Applicants respectfully submit that all pending claims as currently presented are in condition for allowance. If, for any reason, the Examiner disagrees, please call the undersigned attorney at 248-433-7552 in an effort to resolve any matter still outstanding *before* issuing another action. The undersigned attorney is confident that any issue which might remain can readily be worked out by telephone.

Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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